Energy Management Optimization
Valero Houston Refinery

aspentech

VALERO ENERGY CORPORATION

Agenda

Objectives

Energy is the single largest component of variable operating expenses for most large manufacturing industries.

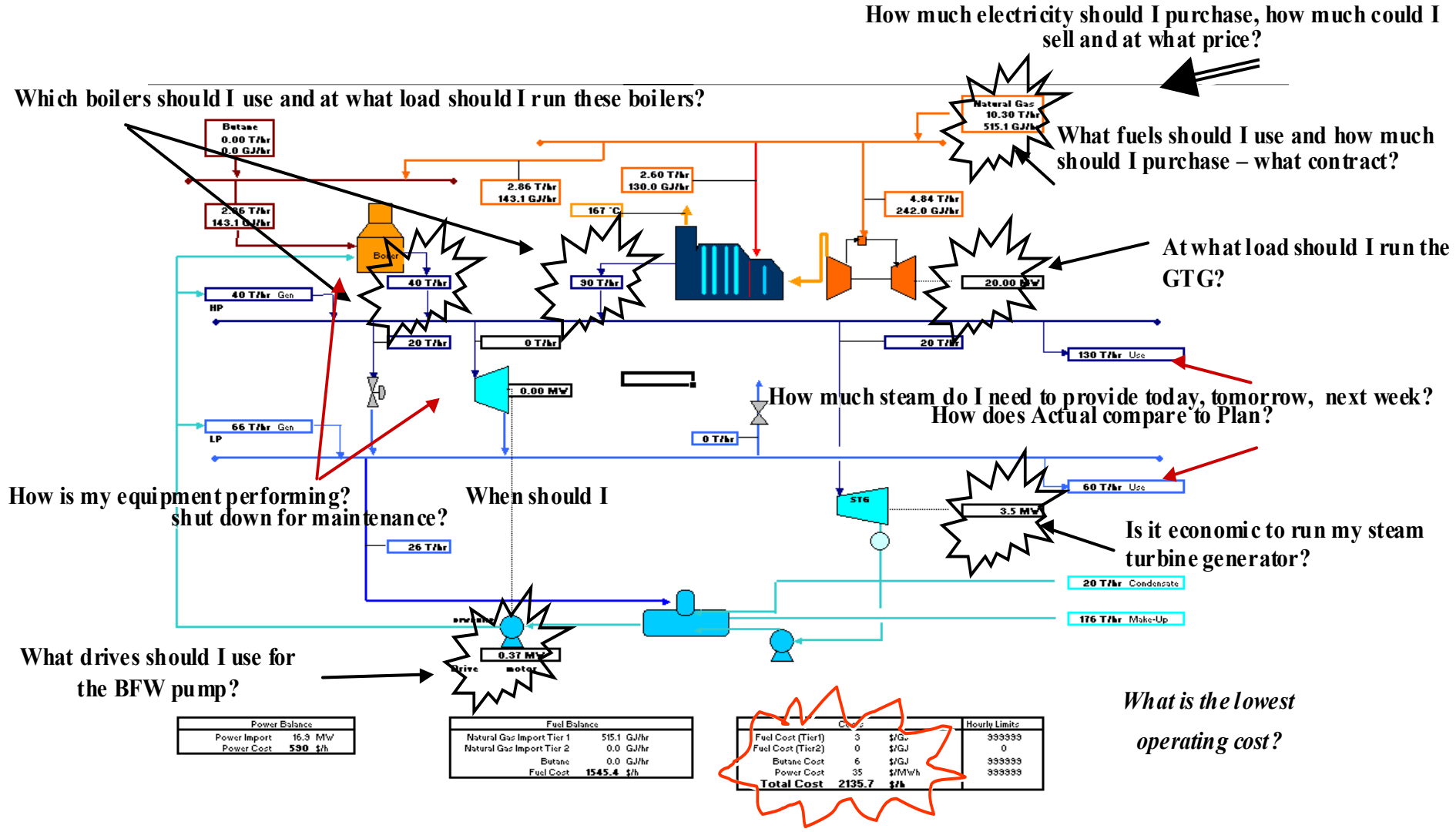
The implementation of an energy management & optimization system for the existing energy assets is an alternative that requires less investment and can be implemented quicker than traditional energy cost reduction methods.

The purpose of this presentation is to provide an overview of the solution that enables energy management optimization.

The Valero Houston Refinery implementation is provided as an example.

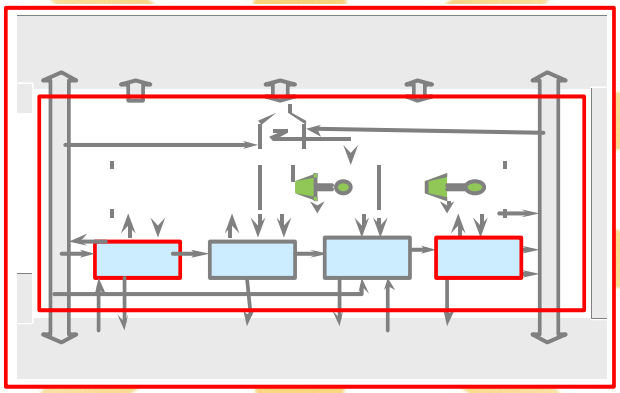
Energy System Operation Challenges

To manage an utility system, many decisions require to be made under many constraints. The challenge is the ability to consider all the constraints and aspect of the problem simultaneously.



Business Processes for Energy Management

Energy Management business processes require the handling of substantial amounts of data as well as many sequence of steps that can be automated.



Investment Planning
Optimise capital for energy efficiency. Eliminate 'regret' capital.

Demand Forecasting
Based on production plans develop a forecast of steam, power and fuel usage

Utilities Production Planning
Use the demand forecast to set an optimum utilities production plan within existing constraints of equipment availability and emissions

Purchasing (tariff evaluation, supply, nominations)
Evaluate best tariffs; ability to reliably nominate supply requirements

Trading (power, CO_2, fuels)
Based on understanding of refinery requirements, set framework for trading (cost, availability etc.)

Optimal Plant Operation (on-line optimisation)
Provide on-line advice to operations personnel on current costs, lowest possible cost and the means to achieve this.

Contract Management
On-going management of contracts to minimise expensive penalties (maximum demand, take-or-pay etc.)

Performance Monitoring
Monitor energy usage of units and actual performance of utility equipment (boilers, turbines etc.)

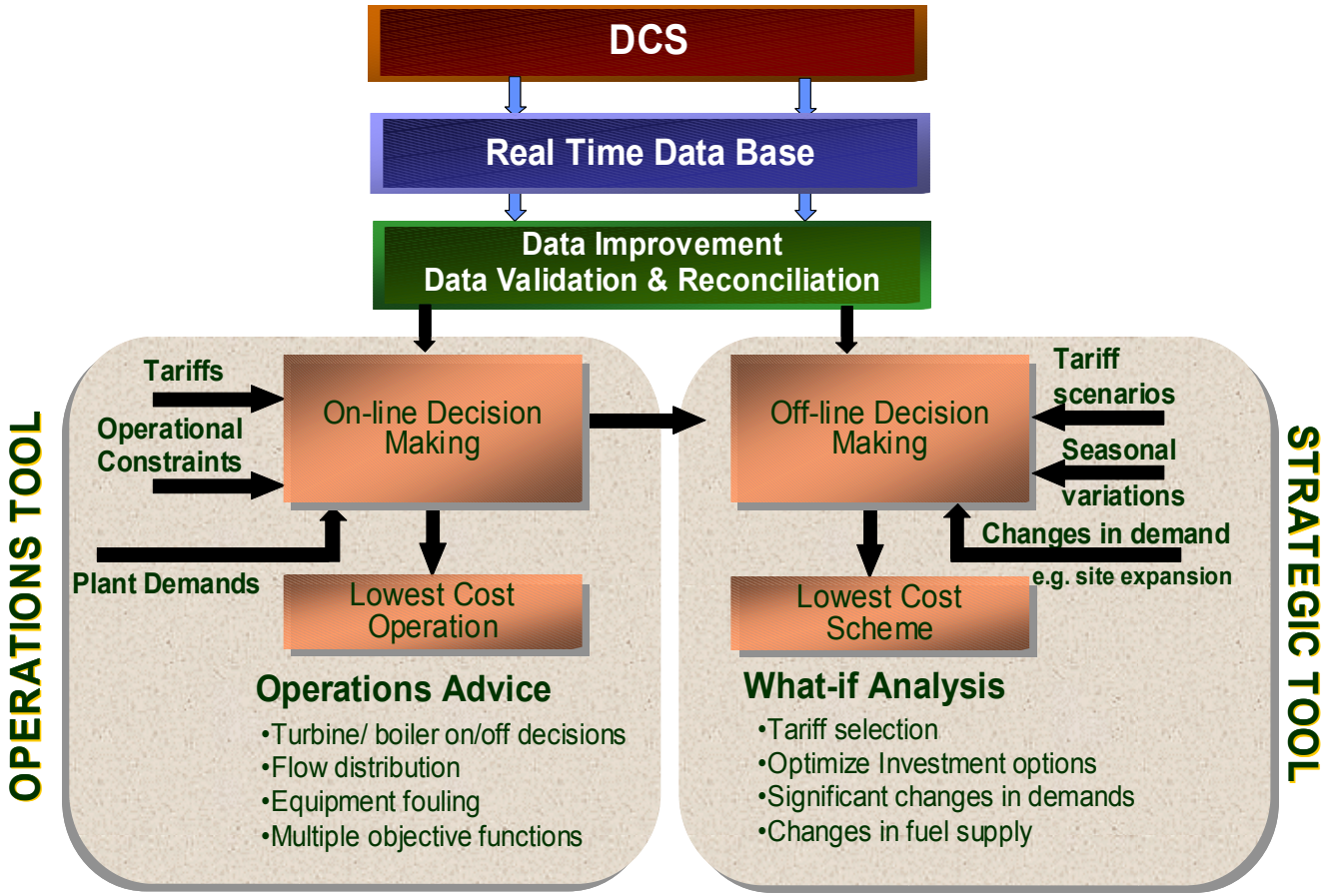
Emissions Monitoring / Constraints
Evaluate emissions costs / constraints (CO_2, SO_x, NO_x)

Cost Accounting (real-time pricing)
Know the true current costs

Energy Optimization and Management Solution

Aspen Utilities™ is a modeling and a flowsheeting application, combined with an optimization capability specially developed for design, operation and management of Utility System within or linked to process plants.

- Functional Overview -

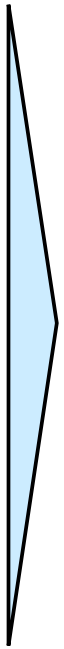


Benefits

Each business process, when optimised as a whole will provide benefits compared to today's operation.

- Benefits -

- Better purchasing (lower contract price, more reliable nominations)
- Better adherence to contract/tariff terms – reduced penalties
- Maximising use of most efficient equipment
- Correct choice and use of fuels
- Reduced hot standby
- Reduced venting of steam
- Better cost accountancy, better decisions based on true costs
- Faster response to problems (and better targeting of problems)
- Optimum scheduling of maintenance
- Reduced time/manpower for accounting, purchasing etc
- More profitable trading
- Reduced capital investment for improvements in energy efficiency
- Increased production (if utilities are bottlenecked)



2 ~ 8% reduction in site-wide energy costs

DSM Case Study

Results

DSM

"In the first year, we achieved millions of Euros of savings through the utilities optimization of our 55 plants, with recurring annual benefits. We now have an improved understanding of our processes, which is helping us make better decisions at the business level"

Jeroen In de Braak
Performance Materials & Industrial Chemicals
DSM

First year benefits of 2.5 million Euros from contract management alone

Selected Aspen Utilities References

Company	Statement
DSM	• "benefits of €2.5 million in first year of operation". Jan Geerts, DSM presentation at AspenWorld 2000
bp	• "The project was completed on time and under budget. • AspenTech worked towards common goals diligently, the result being an essentially seamless transfer of the tool into the refinery Business Processes and wholesale user acceptance of the tool and acknowledgement of the benefits generated from it. • The project was very professionally managed from the AspenTech side and has been used as a model for future projects. Darren Verrenkamp BP
Celanese	•"Energy and environment are key elements of Celanese's operations strategy. We believe that utilities optimization using Aspen Utilities will provide a consistent decision-making framework and better monitoring capability for our site directors, resulting in the optimum supply of utilities to our process plants and reduced utilities bills." Jim Alder, VP Operations and Technical for Celanese Chemicals.

Valero Houston Refinery Implementation

Phased Implementation

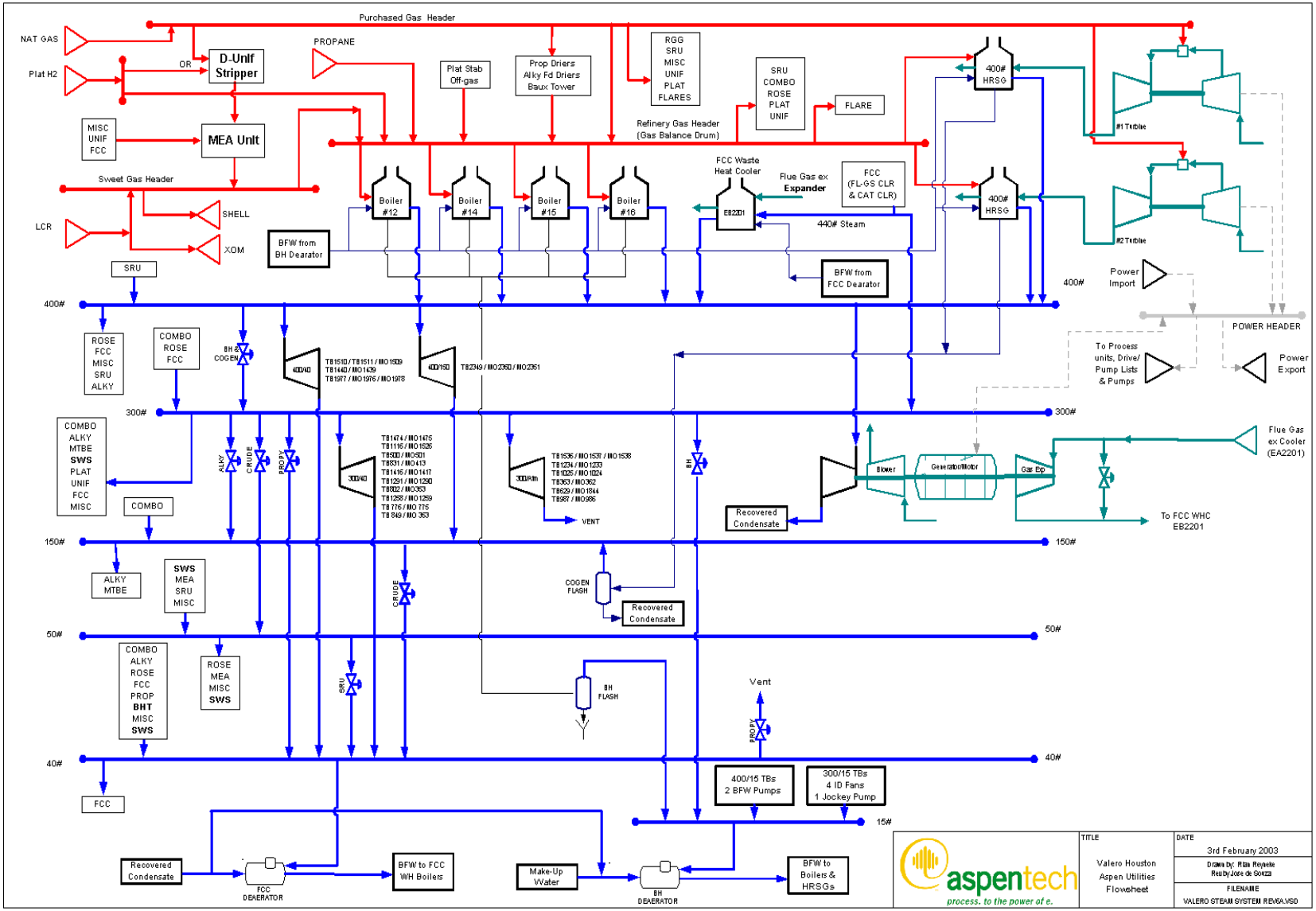
Initially with business processes that drive the most value

- Operational Optimization
- Performance Monitoring
- Utilities Production planning

Pilot Project prior to Corporate Implementation

Close co-operation with Valero for technology transfer

Valero Houston Refinery Energy Optimization System



Houston Refinery Specific Capabilities

On-line open loop advisory optimization that gives advice on:

- Optimum power import/export
- Power load allocation between Gas Turbines and FCC unit power train gas expander
- Optimum trade-off between power generated in FCC flue gas expander and steam generation in waste heat boiler
- Selection of H_2 or fuel gas for hydrotreater stripping medium
- Optimum load allocation between boilers and heat recovery steam generators
- Optimum selection of steam turbines and electric drives

Off-line optimization for planning & strategic development

Plant data validation and reconciliation with faulty meter detection and reporting